

CLAIMS

1. An optical device comprising:

a first refractive index distribution type lens having a first end face and second end face, said first end face being ground diagonally;

first and second ports connected to the first end face of said first refractive index distribution type lens;

an optical functional element connected to the second end face of said first refractive index distribution type lens;

a second refractive index distribution type lens having a third end face and a fourth end face, the fourth end face being ground diagonally and the third end face being placed so as to face the second end face of said first refractive index distribution type lens via said optical functional element, and

a third port connected to the fourth end face of said second refractive index distribution type lens, wherein

an optical path length from said first port to said second port after reflection by said optical functional element, is equal to an optical path length from said first port to said third port after transmission through said optical functional element.

2. The optical device according to claim 1, wherein a length along a center axis of said first refractive index distribution lens is equal to a length along a center axis of said second refractive index distribution type lens.

3. The optical device according to claim 1, wherein a tilt angle of said first end face is equal to a tilt angle of said fourth end face.

4. The optical device according to claim 1, wherein a length along a center axis of said first refractive index distribution type lens having the first and second end faces is equal to a length along a center axis of the second refractive index distribution type lens having the third and fourth end faces and a tilt angle of the first end face is equal to a tilt angle of said fourth end face, wherein each of the first and second refractive distribution type lenses has a shortest side edge and a longest side edge, and

positions of the shortest side edges of the first and second refractive index

distribution type lenses and positions of the longest side edges of the first and second refractive index distribution type lenses are arranged respectively on the same side of the optical device.

5. An optical multiplexer/demultiplexer comprising:

- a first collimator lens having a first end face and a second end face;
- a second collimator lens having a third end face and a fourth end face;
- an optical multiplexer/demultiplexer element inserted between said second face and said third end face;
- first and second ports arranged with respect to said first end face of said first collimator lens; and
- a third port arranged with respect to said fourth end face of said second collimator lens, wherein
 - a first optical path is from said first port to said second port after reflection by said optical multiplexer/demultiplexer element,
 - a second optical path is from said first port to said third port after transmission through said optical multiplexer/demultiplexer element,
 - lights with different wavelengths are combined and separated via said first and second optical paths and said optical multiplexer/demultiplexer element, and
 - said first optical path length is different from said second optical path length in correspondence to a difference in focal lengths of lights with different wavelengths due to wavelength dispersion of said first and second collimator lenses.

6. The optical multiplexer/demultiplexer according to claim 5, wherein said first and second collimator lenses are refractive index distribution type lenses.

7. The optical multiplexer/demultiplexer according to claim 6, wherein said first end face is placed to face diagonally ground faces of said first and second ports and the fourth end face is placed to face a diagonally ground face of said third port, said first and fourth diagonally ground faces are arranged to be parallel to each other and the optical path length of said first and second optical paths are different.

8. The optical multiplexer/demultiplexer according to claim 7, wherein said first and

second collimator lenses are refractive index distribution type lenses,

said first collimator lens has the diagonally ground first end face, which faces the diagonally ground faces of the first and second ports, and the second collimator lens has the diagonally ground fourth end face, which faces the diagonally ground end face of the third port; and

said first and second collimator lenses are placed such that the diagonally ground first and fourth end faces are parallel, and the optical path lengths of said first and second optical paths are different, and

among said lights of different wavelengths, the light of the wavelength whose focal length in a refractive index distribution type lens is longer passes through the longer of said first and second optical paths.

9. The optical multiplexer/demultiplexer according to claim 8 [4], wherein the lengths of said first and second refractive index distribution type lenses are 0.23 to 0.25 times the pitch length of said wavelength with the longer focal length in said refractive index distribution type lens.

10. The optical multiplexer/demultiplexer according to claim 5, wherein said first and second ports are respective optical fibers of a dual fiber pigtail, and an end face of said dual fiber pigtail on a side facing said first side of said first collimator lens is ground diagonally with a predetermined tilt angle, and said third port is an optical fiber of a dual fiber pigtail, and an end face of said dual fiber pigtail facing said fourth side of said second collimator lens is ground diagonally with a predetermined tilt angle.

11. The optical multiplexer/demultiplexer according to claim 5, wherein said first and second collimator lenses are any one of aspherical lenses, ball lenses and spherical lenses.